

An industry view on road safety auditing

Ram, S.A.

Fellow, Engineers Australia; Registered Professional Engineer Queensland

Abstract

This paper provides an industry perspective on road safety auditing (RSA). In particular, it addresses aspects such as:

- Having the right team. A team that has been assembled to provide a balanced and complementary blend of road safety, transport planning, traffic engineering, design, construction, consultation and project management skills and experience.
- Liaising with the client via meetings at the start, during and close of the audit phases, and determining what needs to be achieved from these meetings.
- Considering different road user groups and their perspectives as well as the different vehicle types using the road (e.g. mix of heavy vehicles and cyclists on roads).
- Managing expectations, such as ensuring that the audit team is not being influenced by any preconceived views of different stakeholders (e.g. community or the client).
- Introducing methodologies into the audit process to save time and effort and add value to the outcome.

The paper provides a critique on the standard road safety audit tasks and offers constructive comments. The insight into road safety auditing provided by this paper is applicable to both existing and future projects and at all stages of the project delivery such as planning, design and delivery. The views expressed arise from consulting industry experience in undertaking road safety audits for public and private sector clients.

Introduction

This paper illustrates an industry view on road safety auditing, in particular aspects such as having the right audit team, liaising with the client, consideration of different road users and vehicle types, managing client and other key stakeholder expectations and introducing methodologies in audit process that saves time and effort but adds value to the outcome of the road safety audit.

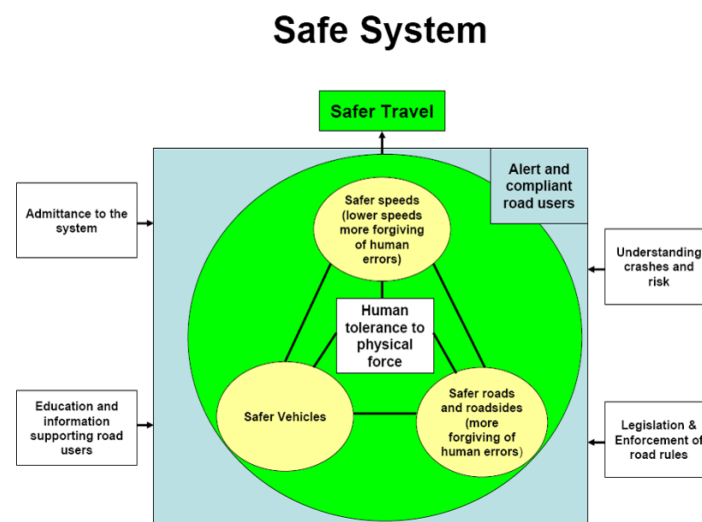
A Road Safety Audit (RSA) is a “formal examination of an existing or future road or traffic project, or any project which interacts with road users” (reference Austroads). The objectives of conducting RSA’s include the identification of potential safety problems for all users of the road corridor and to ensure that measures are introduced to eliminate or reduce problems in relation to safety. The findings relate to how the road user perceives the road network. Benefits of conducting these audits include accident reduction, a safer driving environment in all conditions, better design principles and an assessment of works required to improve and maintain a standard of road commensurate with the traffic volumes and environment.

RSAs have been in practice in Australia for more than twenty years and the RSA process has been recognised in the Queensland and National strategies as a useful tool for improving road safety. Most State road agencies have a road safety audit policy and guideline in place. RSAs cannot be

undertaken by agencies in an ad hoc manner and without a consistent approach in the selection of projects for RSAs, especially in the growing litigation environment. If an agency has a systematic approach to RSAs, it would assist them in managing their road safety risk better.

The “Guide to Road Safety Part 6: Road Safety Audit” (2009) provides a comprehensive introduction to the road safety audit process. Easy to read and implement, the guide is suitable for use by any person with a responsibility for, or an interest in, road safety. Austroads’ “Safe System” approach diagrams (see Figure 1) capture all the elements that need to be addressed in a road safety audit. By taking a total view of the combined factors involved in road safety, the Safe System approach encourages a better understanding of the interaction between the key elements of the road system: road users, roads and roadsides, vehicles and travel speeds.

Figure 1. Safe system approach diagram (source: Austroads)



In late 2012, ISO 39001 was published and established a management system standard for road traffic safety. The standard is a practical tool for governments, vehicle fleet operators and all organizations worldwide who want to reduce death and serious injury due to road crashes. ISO 39001 provides them with state-of-the-art requirements for safety aspects including speed, vehicle condition and driver awareness.

Implementing a road agency’s road safety audit policy will reduce the agency’s risk in legal liability and it will deliver improved safety benefits to the community by having safer roads. Agencies need to consultatively agree on the minimum number of RSAs being conducted on the appropriate projects (planning & design) and existing roads. There is a need for annual reporting of RSAs and reviews of RSA policies every five years, ideally based on an assessment of how effective the response to the audit findings have been where crash reduction has been an input to the economic assessment of the project.

Government agencies such as Queensland Department of Transport and Main Roads (TMR):

- Have Road Safety as a key objective in their corporate vision
- Have a Road Safety Audit policy (2008) that sets out TMR’s direction and guidance on road safety auditing. There is a need for considering RSAs strategically and providing the required funds to implement the RSAs. TMR programs that allow for road safety audits include the Federal Blackspot and Nation Building programs, the State Safer Roads Sooner program and TIDS programs. Funds from speed camera offences are also linked to road safety improvements.

- Specify / recommend that road safety audits should be undertaken at planning, design and preopening stages of a road project, potentially the number of audits relating to project value or measure of significance as well as for existing roads (frequency), particularly where the crash rate is higher than average for the type of road.
- Maintains a register of accredited road safety auditors. The database contains details about auditors' knowledge and experience in road safety auditing, including recent audits, certification level, and registration expiry date. In order to reinstate/renew a registration, a road safety auditor needs to provide evidence of their recent maintenance and experience in road safety auditing. The Road Safety Auditor Registration Guidelines require that knowledge and experience in road safety audits be maintained by participating in required number of audits per year (e.g. in NSW three design and three existing RSAs for lead auditor)
- Maintains a database of all RSAs undertaken on State-controlled roads and National Highways to manage and track the implementation of recommendations (especially for existing road RSAs) linked to audit findings
- Evaluation of RSA program for continuing funding (e.g. FORS funding requires some evaluation).

It remains unclear whether all planning, design and newly constructed road projects are or should be subject to road safety audits and if not, why not? As well, at what frequency should existing roads be audited and what are the drivers (e.g. highest risks, high levels or peak in crash statistics or deterioration in road asset condition) for undertaking these road safety audits. There is a need for a road safety audit policy to be applied consistently across the country, with appropriate criteria for undertaking RSAs for the planning and design phases of major projects and for existing roads. Until and unless the road agencies and industry make it a requirement through legislation, road safety audits will not be a fully recognised “value add” to a project. There is anecdotal evidence that there are road owners, managers, operators and builders with no or limited understanding of road safety auditing and the audit process and, equally, some project managers in the industry show a predilection to do nothing, particularly where the first audit is at the detailed design stage. It is probably timely for the road safety community to debate the use, need and benefits of RSAs through bodies such as Consult Australia and Engineers Australia.

Within Queensland there appear to be some variations in the scope of RSAs compared to what is required by the Austroads Standards. Some regions within Queensland go beyond the outcome of ranked or prioritised findings and recommendations, and require an inventory of road asset conditions, indicative cost estimates and allocation of findings to the responsible implementation group. In NSW, the road safety audits require findings to be identified and generally no actions recommended. The reasoning for this is self-evident in that an audit finding and recommended action may be seen to impose a solution on the designer, which may not be the designer's preferred solution based on a range of other criteria, such as cost (e.g. 500m of Type F barrier in lieu of “brifex wire rope”). A project manager who chooses not to adopt the audit recommendation would need to be very confident that the decision could be justified in safety terms, not just economics. Generally the standard and normal road safety audit processes are being implemented around Australia.

When considering which new roads and projects to audit, the focus should be on the degree of risk for road users, rather than the project cost. A lower cost project that has a high degree of risk involving vulnerable road user groups (e.g. school children, elderly pedestrians, cyclists), heavy vehicles, high traffic volumes or high traffic speeds, can have a far greater potential for greater risk if its design includes a significant safety deficiency. A formal audit of this type of project is, on average, going to produce greater benefits to the community. Sometimes it may be hard to identify risks at planning stage unless project objectives identify specific safety objectives (e.g.

improvements to pedestrian crossing opportunity at rail station) or it may be identified by the project BCR / contribution of crash reduction to the project evaluation (e.g. identify low cost projects, which have a respectively high BCR because of crash reduction estimates)

This paper highlights that the real value of RSAs will only be achieved when all parties recognise the benefits of undertaking a RSA, and more importantly, ensuring some of the key ingredients, as discussed further, to deliver a successful RSA are implemented.

Table 1.0 below highlights the difference between a Road Safety Audit and a traditional safety review.

Table 1. Road Safety Audit versus Traditional Safety Review

Road Safety Audit	Traditional Safety Review
Performed by a team independent of the project	The safety review team is usually not completely independent of the design team.
Performed by a multi-disciplinary team	Typically performed by a team with only design and/or safety expertise.
Considers all potential road users	Often concentrates on motorised traffic.
Accounting for road user capabilities and limitations is an essential element of an RSA	Safety Reviews do not normally consider human factor issues.
Always generates a formal RSA report	Often does not generate a formal report.
A formal response report is an essential element of an RSA	Often does not generate a formal response report.

Source: <http://safety.fhwa.dot.gov/rsa/>

The Road Safety Audit Team

Having the right team that provides a balanced and complementary blend of road safety, transport planning, traffic engineering, design, consultation and project management skills and experience is critical factor for influencing the outcome of a road safety audit. Clients at times request or the industry may offer the client an opportunity to nominate one of the client road safety auditors to be part of the team to participate in the RSA process. Some of the advantages include increasing the size of the team for no extra cost to the consultant, training for the client auditor and demonstration of transparency. There is some question that a client auditor could influence the team towards the client's outcomes. This contradicts an earlier point made in this paper about independence of the RSA team. Key ingredients in a team to deliver a successful RSA are discussed further.

Road Safety Audit Teams (RSAT) members need to be motivated to identify and prioritise findings, in credible reports. Motivation however comes from within as well as influenced by external factors, such as recognition and reward. RSAT should participate in award submissions and thought-leadership industry events (e.g. seminar and conference papers) for visibility and recognition by peers, industry and public (e.g. media). We need to review how the RSAT "brand" has been conveyed internally within an organization and externally to clients and stakeholders, i.e. what RSAT tells it's organization about itself or the road safety auditing services and what it wants and aspires to be? Conversely, we need to consider the "reputation" of the RSAT, i.e. we need to know how clients and industry feel about RSAT (e.g. what RSAT has done or delivered and how is seen by clients)? This information can be obtained through surveys such as TMR's project

completion reviews. Proper recognition of RSATs will influence the members to have an ongoing interest in and delivery of RSAs.

Rightfully, clients should require RSATs to have a lead auditor and another one or two qualified auditors. The RSAT can always seek specialist inputs from engineering disciplines (e.g. pavement, hydraulics or lighting) or crash analysts, psychologists or behavioural scientists. Trained and accredited auditors as well as an organisation's most experienced auditors should be active participants for a number of obvious reasons (e.g. trainers for less experienced team members and to provide best value and expertise to the client). Notwithstanding the cost involved, experienced lead auditors should review and approve all work undertaken by RSAT (e.g. approval of completed road safety check list, findings and recommendations). Timeliness and budgets associated with a road safety audits should not impose unreasonable limitations on the use of a proper and correct RSAT make up as discussed above.

State Transport agencies need to establish "centre of road safety excellence" standards represented by private and public sector RSAT members to provide strategic guidance and technical advice on Road Safety Auditing. The issue of affordability needs to be addressed to provide adequate funds to undertake RSAs and to implement the recommendations linked to a list of prioritised findings.

Client Liaison

Liaising with the client via meetings at the start (inception meeting), during and close of audit phases, and determining what needs to be achieved from these meetings, has to be well understood by RSAT and the client. Client liaison is important however anecdotal evidence suggests that this task is underestimated. Auditors are typically not familiar with project objectives and challenges and these aspects need to be understood and considered during a road safety audit. Information and advice received from client liaison reduces the likelihood of putting forward "good in theory but not feasible for this project" recommendations.

Client education (where necessary) to avoid knee jerk reaction to defend the design at all costs, so responding to audit findings becomes an exercise in avoiding any action (common when the first audit is at Stage 3). Ultimately it is the response to the audit that generates action, so no matter how thorough the audit, if no action or only simple improvements (e.g. line marking or sign posting) are undertaken, then the audit has not realised its full value. Permissible non-conformances are the universal escape clause but this does not stop the auditor from raising a safety issue.

The timing of the various meetings forms the overall road safety audit task as referred to in Section 5.0. The purpose of the inception meeting is to discuss the section of road being audited and especially to clarify any information previously provided as background in the project brief. It also serves to provide the following:

- Reach agreement on the project methodology and the proposed programme and reporting format
- Obtain all available project material that would assist in the timely delivery of the audit including information on recently completed or programmed improvement works which may be useful during the site inspection as background information
- Obtain information on defining minor and major works for improvements
- Obtain information on already planned future improvements (Note: preference should be to undertake RSA without budget constraints and then improvement works can be prioritised on a value for money basis)

The meetings or any other liaison during the audit process assists in responding to any issues requiring urgent or immediate attention. It also provides an opportunity for participation by a client

auditor in the road safety audit inspections. Their participation also allows the client to understand the issues and have credibility in the RSA process. The frequency and number of progress meetings often depends on project specific parameters e.g. size, duration, client specific requirements and expectations.

The close out or completion meeting is held with the client's Project Manager and the RSAT to:

- Confirm RSA findings and final report
- Discuss additional safety issues
- Table and discuss clients Project Completion / Performance Report

Managing expectations such as the audit team not being influenced by any preconceived views of different stakeholders (e.g. community or the client) is also considered important to maintain the independence of the RSAT. This way the findings and recommendations remain independent.

Consideration of Different Users

Revisiting the definition of a road safety audit shows the importance of considering all road users or vehicle types that may use an existing or future road.

“A Road Safety Audit (RSA) is a “formal examination of an existing or future road or traffic project, or any project which interacts with *road users*” according to Austroads. The objectives of conducting RSAs include the identification of potential safety problems for *all users* of the road corridor, and to ensure that measures are introduced to eliminate or reduce problems in relation to safety. Benefits of conducting these audits include:

- Accident reduction
- A safer driving environment in all conditions
- Better design principles
- Assessment of works required to improve and maintain a standard of road commensurate with the traffic volumes and the environment.

The consideration of different road users and their perspectives, and the different vehicle types (e.g. mix of heavy vehicles, cars and cyclists on roads) will identify safety issues and recommendations that will be relevant to all or specific road user and vehicle types. The complexity of safety issues is related to the mix of users or vehicle types (i.e. the greater the mix of users, the greater the identification of safety issues). There are times that a future industry expansion (e.g. opening of a new mine) could result in greater usage of a road by heavy vehicles which also results in understanding safety issues linked to travel paths, road side clear zones and sight distances.

The road users are also affected by the environment (day/night, dry/wet, glare /shades), age (old and young) and behaviours (tired /fatigue). All of these factors contribute to the safety of the user of the road.

Methodology

The RSA activities discussed in this section applies to an existing road or a future project (planning to design to preopening stages). The views expressed arise from consulting industry experience in undertaking road safety audits for public and private sector clients. Clients are looking at undertaking RSAs innovatively and within agreed fees and timelines. Therefore introducing initiatives in the audit process that save time and effort and add value to the outcome, is what clients

are looking for. This section provides a critique on road safety audit tasks (diagrammatically shown in Figure 2) and offers constructive comments.

- Audit Entrance / Inception Meeting
 - Can be undertaken remotely using video conference plus screen sharing (office communicator, WebEx) especially for planning and design RSAs
 - The supply of relevant maps and plans in electronic format (CD, Excel Spread sheet, PDF), assist in time savings
- Data Acquisition and Review
 - Review data (crash, volume and speed) provided by client and follow up any queries immediately
 - Familiarise with standards, guidelines and proformas for site inspections
 - For existing roads undertake an analysis (e.g. use of GPS visual crash patterns analysis) of any existing crash locations to identify potential safety risk ‘hot spots’ and repetitive crash types.
 - Use Safety Tools to undertake pre-inspection Job Safety and Risk Assessment (JSRA) which enables preparation of project and site specific Safe Work Method Statements (SWMS) for all key tasks to be undertaken as part of the existing Road Safety Audit.
 - All members of the RSAT should undergo a project induction and be made aware of the need to become familiar with all relevant safety issues pertaining to the project
 - Understand and sign off on the project specific JSRA and SWMS
- RSA Site Inspections and Completion of Checklists
 - Undertake day and night inspections and at times adverse weather inspections
 - Undertake a “ball bank” assessment of substandard curves, check sight distances and hidden sags / crests and accesses
 - Utilise the checklists from Austroads *Guide to Road Safety Part 6: Road Safety Audit 2009*
 - There may be occasions for impartial engagement with local residents and discuss any near misses, unreported crashes or any other local knowledge
- Data Collection and Processing
 - Use of field data collection tools, e.g. Inspecta, to collect data more efficiently
 - Use of GIS & Spatial Systems team to produce quality maps and plans for the RSA
 - Use of Systems (e.g. “Inspecta Lite Asset Inspection System”) provides the efficiency of electronic form based field collection, coupled with GPS location information and photographs. The output result is a spreadsheet containing all information collected in the field, associated photographs and GPS coordinates of each inspection.
 - Use of Inspecta Lite allows RSAT to efficiently capture the existing street furniture/signs inventory while focusing on the analysis components of the task at hand.
 - The final GIS data should be in a format which is compatible with existing client’s systems.

- Recommendations, Prioritisations and Estimates
 - RSAT provides suggested actions to address the road safety deficiencies
 - Actions recommended should be practical and feasible with reference to crash history as appropriate along with justification for identifying as a hazard. Wherever available, evidence such as photos or aerial photography should be provided to assist in justification and presentation of the finding and recommendation.
 - RSAT assigns each action with a priority in accordance with Austroads Section 4.8c “Risk Ranking of Safety Issues” (i.e. A, B C or D).
 - RSAT can assign a preliminary cost estimate to each recommended action and summarise these costs for each of the work categories if it is within the agreed scope.
 - Wherever works are proposed, sketch / layout designs of recommendations should be provided indicating critical dimensions.
 - In all cases, the RSAT needs to consider the likelihood of harm occurring, the severity of harm if it occurs, the (additional) cost or benefit cost ratio (BCR) of the solution, the effectiveness of the solution and any other relevant factors.
 - Recommendations of a design audit require a decision on whether or not to agree firstly that the identified issue is a problem, and secondly whether or not to agree that the recommendation is the best way to resolve the problem. High prioritisation often motivates or influences a project manager who otherwise may not be aware of any road safety issues. High number of high priority issues can highlight flaws in the design. If a design solution costs more than the budget allows, the project manager needs to decide if the budget needs to be increased, if staging can be altered or if there is an acceptable lower cost solution. RSA is also a communication tool, often with relatively wide audience.

- Preparation of Draft Report & Sketches
 - A Draft RSA Report should be prepared to professional format. The information recorded in the report should be broken up into homogenous road segments.

- Delivery of Draft Report
 - Resolution on all findings of the RSA, inventories and sketches.
 - Sign off by client to provide comments on the Draft Report, and discuss ways to finalise report.
 - Confirmation of date for the joint site inspection.

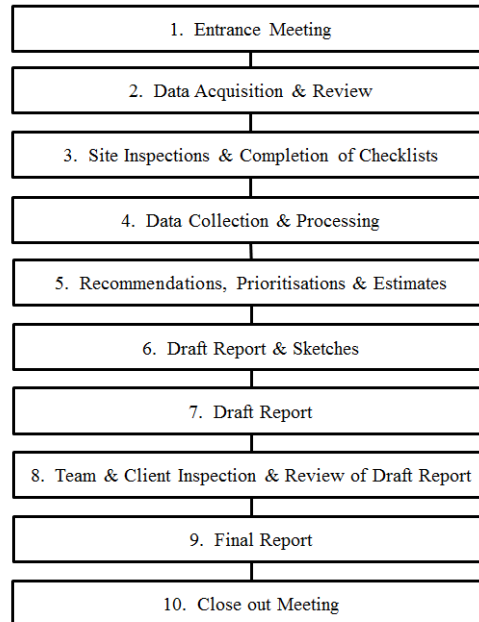
- RSAT and Client Site Inspection (for existing and pre-opening RSAs)
 - RSAT and client should jointly attend a site inspection after the delivery of the draft report. This site inspection should provide additional safety comments, findings and recommendations to include in the final report.

- Final Report and Completion Meeting
 - Any client comments on the draft RSA report should be addressed, and a completion meeting held with Client’s Project Manager and RSAT audit team to:
 - Confirm RSA findings and final report
 - Discuss additional safety issues

- Table and discuss TMR's Project Completion Report

A summary of the abovementioned road safety audit tasks is diagrammatically represented in Figure 2 below.

Figure 2. Road Safety Audit Methodology



The RSA process and policy should be reviewed by industry and agencies every five years to monitor its effectiveness in achieving the objective of reducing the potential for crashes. The items worthy of review include:

- Are the required or appropriate numbers of audits being undertaken in a region?
- Are the audits being conducted in an effective manner? (Considering timing, resources, experience applied and outcomes)
- Are responses to audits being made in accordance with Austroads guidelines?
- Is the road safety audit process effective? (i.e. are the potential safety problems being identified and are crash rates consequently reduced?)
- Percentage of recommendations actually implemented and whether they were influenced by cost or risk level

Across Australia, the road agencies' approach to road safety is consistent with the national commitment to the Safe System framework mentioned earlier. The Safe System framework seeks to prevent crashes in the first instance and minimise injury severity when crashes do occur. This broad approach to road safety improvement emphasises system-wide interventions to address human limitations.

Summary

Road agencies need to implement RSA policies and guidelines with a plan to review them every five years through a Road Safety Audit Tracking System. This would contribute to the road safety agencies managing their road safety risk better. The requirements of any policy or guideline need to be practical and easy to monitor. Some of the aspects of RSAs that auditors need to pay particular attention to include:

- Recognising the importance and benefits of RSA through legislation, policies and guidelines
- Ensuring a balanced RSAT with road safety and other relevant skills led by a Lead Road Safety Auditor
- Ensuring client liaison at the start, during and end of an RSA
- Ensuring use of technology to improve outcomes and save time and cost of RSA
- Ensuring independence in the conduct and reporting of the RSA
- Promoting the benefits of RSA internally to peers and colleagues and externally to clients

References

- ALGA National Local Roads & Transport Congress, 2011, *ISO 39001 Road Traffic Safety Management - A New Management Tool for Safe Road Transport*, 18 November 2011, Mt Gambier. Accessed (18/05/2013) <http://alga.asn.au/site/misc/alga/downloads/roads-congress/2011/Martin_Small.pdf>
- Austroroads, *Guide to Road Safety Part 6: Road Safety Audit 2009*
- Australian Transport Council, 2009, *National Road Safety Action Plan 2009 and 2010*, Australian Transport Safety Bureau, Canberra.
- Austroroads, 2011, *National Road Safety Strategy 2011-2020 (NRSS)*, Sydney
- International Organization for Standardization, ISO 39001:2012, *Road traffic safety (RTS) management systems*. Accessed (18/05/2013) <http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref1661>
- RTA, Version2 – August 2005, Technical Direction for Road Safety Practitioners, “Policy for Road Safety Audits of Construction and Reconstruction Projects”, RTA – NSW, 2005
- Queensland Transport, *The Queensland Road Safety Strategy – 2004 - 2011*, Queensland Transport, 2003